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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H04L 12/56 — A1

(11) International Publication Number: WO 00/62493

(43) International Publication Date: 19 October 2000 (19.10.00)

(21) International Application Number: PCT/US00/08264

(22) International Filing Date: 29 March 2000 (29.03.00)

(30) Priority Data:
09/289,464 9 April 1999 (09.04.99) US

(71) Applicant: GENERAL DATACOMM, INC. [US/US]; Park Road Extension, Middlebury, CT 06762 (US).

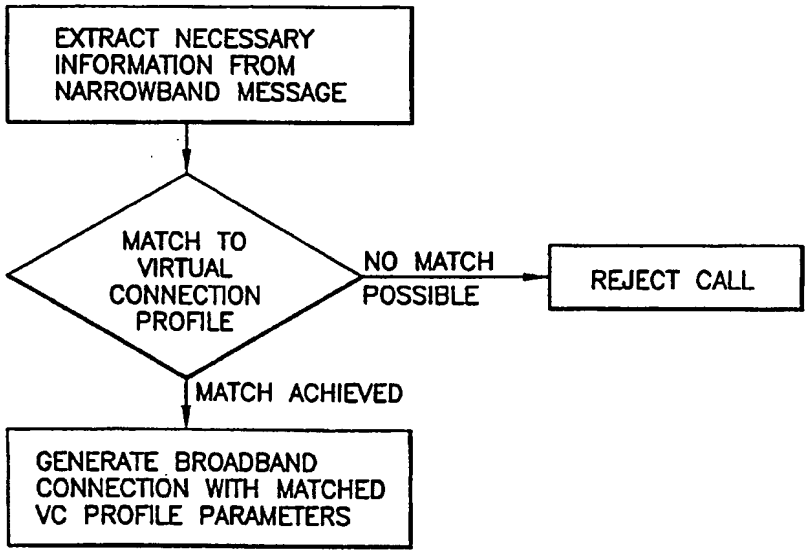
(72) Inventor: CASSELLA, Pasquale, K.; 1087 Johnson Road, Woodbridge, CT 06525 (US).

(74) Agent: GORDON, David, P.; 65 Woods End Road, Stamford, CT 06905 (US).

(81) Designated States: AU, CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: METHOD AND APPARATUS FOR GENERATION OF ATM AAL2 TYPE BROADBAND SETUP MESSAGE FROM NARROWBAND SETUP REQUEST



(57) Abstract

Narrowband voice call SETUP messages from, e.g., a central office or PBX over a signalling channel are received by an ATM switch which utilizes one or more of particular characteristics of the narrowband call SETUP request to establish a VC (virtual channel) profile. Using the VC profile and the called party number, the ATM switch generates a broadband call SETUP message in cell format, which is placed on the control plane of the ATM network. In this manner, an interworking is established where incoming narrowband call SETUP requests are handled on a call–by–call basis to produce broadband call SETUP requests on SVCs.

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METHOD AND APPARATUS FOR GENERATION OF ATM AAL2 TYPE BROADBAND SETUP MESSAGE FROM NARROWBAND SETUP REQUEST

The present invention is related to co-owned U.S. Serial No. 09/015,503, filed Jan. 29, 1998 and entitled "Voice Server Module for ATM Switch", which is hereby incorporated by reference in its entirety herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to telecommunications. More particularly, the present invention relates to the interworking of narrowband signaling with broadband signaling, and specifically to the generation of broadband call SETUP messages from incoming narrowband messages.

2. State of the Art

For approximately a century, the narrowband telecommunication network was the dominant mechanism for all telecommunications in the U.S and worldwide. The narrowband telecommunications network was designed and primarily directed to the transport of voice information, with analog lines between homes and offices and central offices, and trunks between central offices. Over the years, different protocols have been added to the narrowband telecommunications network to handle various aspects of the network. For example, during the last fifteen years or so, an SS7 overlay network has been provided for signaling. In addition, as data and video transport has become an important use of the telecommunications network, narrowband ISDN was touted as a desirable protocol for handling video, voice and data.

Because the demand for the transport of data and video has virtually exploded over the last ten years, a new network based on asynchronous transport mechanism (ATM) telecommunications technology has been defined and built. Thus, there now exist two primary backbones to the telecommunications network in the

U.S. and worldwide. The ATM network (also referred to herein as the "broadband" network) was originally conceived and provided primarily for data transport (as opposed to voice). However, because of the flexibility and advantages of ATM, demand has grown for the carrying of voice over the ATM network. In response to that demand, various organizations such as the ITU-T and the ATM Forum have defined ATM Adaptation Level 2 (AAL2) standards and recommendations which are intended to integrate the carrying of voice data into the ATM scheme. While the AAL2 standard has been established, presently, there is very little commercial activity utilizing AAL2. This lack of activity is probably the result of the present requirements for the use of AAL2. In particular, presently, in order to utilize AAL2, the customer must provide the network with AAL2 type information in generating a call. Alternatively, a non-ATM type call may be carried in certain very limited circumstances by the ATM network by establishing a PVC (permanent virtual channel) for the user which carries all non-ATM voice data (i.e., there is a static map from the incoming narrowband call to an outgoing broadband call). However, these uses of AAL2 require either the purchase of specialized equipment by the user, or the maintenance of an expensive PVC link. True interworking for voice data between the narrowband network and the ATM network has not yet been established in the art.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide an interworking mechanism for narrowband and broadband voice signals.

It is another object of the invention to provide an apparatus and method for causing narrowband voice-related call SETUP messages to be translated into broadband call SETUP messages on a call-by-call basis.

It is a further object of the invention to provide a narrowband to broadband signaling protocol for voice signals.

In accord with the objects of the invention which are described in more detail hereinafter, narrowband voice call SETUP messages from, e.g., a central office or PBX over a signaling channel are received by an ATM switch. The ATM switch then utilizes one or more of particular characteristics of the narrowband call SETUP request to determine a VC (virtual channel) profile. Using the VC profile and the called party number, the ATM switch generates a broadband call SETUP message which is placed on the control plane of the ATM network.

According to a preferred aspect of the invention, the ATM switch has a "DS0 to numbering plan" database, a "numbering plan - called party number - VC profile" matrix, a "VC profile" database, and a broadband call SETUP message generator. When the signaling DS0 to which the ATM switch is coupled has a narrowband voice call SETUP message therein, the channel ID of the narrowband call SETUP is used to access the DS0 to numbering plan database, and the accessed numbering plan and the called party number are used to find a VC profile in the numbering plan - called party number - VC profile matrix. The VC profile accesses the VC profile database for the parameters contained therein. Those parameters and the called party number are then used by the broadband call SETUP message generator to generate a broadband call SETUP message for the voice call.

It should be appreciated that there are various advantages provided by the apparatus and method of the invention. First, by providing true interworking between the narrowband and broadband networks, voice calls placed on the narrowband network can be carried by the broadband network without requiring the user to obtain expensive equipment. Second, by providing true interworking and providing necessary databases, incoming call SETUP requests can be handled dynamically to produce broadband call SETUP requests on SVCs, rather than requiring maintenance of expensive PVCs.

Additional objects and advantages of the invention will become apparent to those skilled in the art upon reference to

the detailed description taken in conjunction with the provided figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a high level diagram of an ATM switch incorporating the narrowband to broadband interworking of the invention;

Fig. 2 is a block diagram of a voice server module of the ATM switch of Fig. 1;

Fig. 3 is a high level flow diagram of the method of the invention.

Fig. 4 is block diagram representing data structures utilized in the interworking method of the invention.

Fig. 5a is a prior art chart detailing the SETUP message for a narrowband Q.931 ISDN signal.

Fig. 5b is a prior art chart detailing the SETUP message for a narrowband SS7 ISUP signal.

Fig. 5c is a prior art chart detailing the SETUP message for a broadband ATM signal

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The method and apparatus of the invention for the generation of ATM AAL2 type broadband call SETUP messages from a narrowband call SETUP request is preferably implemented in an ATM switch such as the GDC APEX (a registered trademark of General DataComm, Inc.) seen in Fig. 1, although it will be appreciated that many other switches could be utilized to embody the invention. The GDC APEX switch 10 includes a mid-plane 14 having a switch fabric card 15, a plurality of line interface modules (LIMs) 16a, 16b..., and a plurality of controller cards

(also called "slot controllers") 18a, 18b, ... The function of each of the LIMs 16 is to take incoming electrical or optical signal information from various lines, such as data channels, private networks, public networks, etc., to extract data and timing information therefrom, and to send a TTL digital signal representative of the data to an associated controller card 18. The controller cards include adaptation controllers and cell controllers. The function of the adaptation controller is to convert the TTL digital signals received from LIMs receiving legacy signals (e.g., T1, E1) into an ATM signal (i.e., ATM adaptation). The ATM signal is then forwarded to the switch fabric for switching as desired. After switching, the ATM signal is provided to a cell controller which forwards the ATM signal to a LIM which is coupled to the ATM network (not shown).

According to the present invention at least one of the slot controllers 18 of the ATM switch 10 is a voice server module (VSM) which is configured to accept voice data, as well as other data from a LIM. In a preferred embodiment, each VSM slot controller 18VSM is capable of processing data received from a LIM which is coupled to four E1 or T1 lines at 2.048 Mbits/sec or 1.544 Mbits/sec respectively. Where the LIM is coupled to T1 lines, the LIM performs a timing conversion such that the data presented to the VSM slot controller 18VSM is at the E1 2.048 Mb/s rate.

Turning to Fig. 2, a block diagram of a voice server module 18VSM is seen. The voice server module 18VSM includes a multiplexer/interface 20, a voice processing DSP array 30 for processing voice data, an adaptation layer processor 40, a management processor 50, a channel associated signaling (CAS) processor 60, and a LIM-management interface 70. Details of the functioning of each of the elements of the voice server module are provided in previously incorporated U.S. Serial No. 09/015,503. For purposes of the present invention, it is noted that the narrowband call SETUP request (carried on a D-channel) is received by the highway combiner/D-channel extractor, and forwarded to the management processor 50. The interworking of the invention is preferably carried out by the management

processor 50 as described below with reference to Figs. 3 and 4. As a result of the interworking, the management processor 50 generates a broadband call SETUP request (in ATM cell format) which is sent out of the switch via the multiplexer 80, the switch fabric 14, etc.

According to a preferred embodiment of the invention, the management processor has memory 100 associated therewith. As seen in Fig. 3, the memory 100 is configured to include a "DS0 to numbering plan" database 110, a "numbering plan - called party number - VC profile" table (matrix) 120, and a "VC profile" database 130, although one or more of these memory elements could be located in a different memory if desired. When the signaling DS0 to which the ATM switch is coupled has a narrowband voice call SETUP message therein, the signaling information (carried on the D-channel) is provided by the highway combiner/D-channel extractor 20 to the management processor 50. As seen in prior art Fig. 5a, and known in the art, if the incoming signal is a Q.931 signal, it includes at least a protocol discriminator, a call reference, a message type (e.g., SETUP), bearer capability, a channel identification (indicating in which DS0 the call is being carried), and the called party number. In addition, the Q.931 signal typically also includes information regarding one or more of: network specific facilities, low-layer compatibility, high-layer compatibility, a transit network selector, the calling party number, etc.. Similarly, as seen in prior art Fig. 5b, the SS7 ISUP type SIF signal includes a circuit identification code (CIC) which is equivalent to the channel ID of the Q.931 signal, and certain signaling information such as: the called party number, the calling party's category, and user service information. Optional information may also be carried by the ISUP message.

In the preferred embodiment of the invention, upon receiving the narrowband call SETUP request, the management processor finds the channel ID contained in the narrowband SETUP message and uses the channel ID to access the DS0 to numbering

plan database 110. The numbering plan obtained from the database 110, and the called party number are then used to find a VC profile from table 120. The VC profile obtained from table 120 accesses the VC profile database 130 for the parameters contained therein, including quality-of-service (Qos) and ATM traffic descriptor parameters such as peak cell rate (PCR), sustained cell rate (SCR), and maximum burst rate (MBS). Those parameters and the called party number are then used by the management processor to generate a broadband call SETUP message for the voice call according to the requirements of prior art Fig. 5c.

More particularly, and with reference to Figs. 3 and 4, when the narrowband call SETUP request is received, necessary information contained therein (i.e., necessary for practicing the invention) is extracted by the management processor. This information preferably includes the channel ID and called party number. The channel ID sets forth in which DS0 the call is to be carried. Because each DS0 can utilize a different numbering plan (e.g., the same "001" country code prefix can be used to call different locations depending upon who is calling), both the numbering plan (or channel ID) and the called party number serve as inputs to the table 120 in order to find a VC profile. The value of utilizing a DS0 to numbering plan database 110 is that the database need not be located in the same memory as the table 120. Thus, for example, if the Q.931 and ISUP interworkings are carried out in different management processors (each using its own table 120), the separate DS0 to numbering plan database 110 could be utilized in both situations.

The numbering plan and called party number to VC profile table 120 is shown to include six fields, including the numbering plan (NP), a routing flag (FG), the VC profile number (VCPRO), the compression type (CMP), the called party number (CLPNUM), and the broadband address (BBA). The numbering plan relates to the ability of different DS0s to use the same number to call different parties as discussed before. The routing flag is used for expediting rerouting when an initial route is not

available. The VC profile number relates to parameters of the virtual channel onto which the call is to be routed (as discussed below). The compression type relates to the mechanism used to compress the voice data (such as ADPCM, PCM, etc., as described in more detail in the previously incorporated U.S. Serial No. 09/015,503). The called party number is shown as including prefix information, including area codes and central office codes. It will be appreciated that the CLPNUM can include international codes and additional information if desired. The BBA relates to an ATM switch address.

As indicated in Fig. 4, if the numbering plan and/or called party number are not found in the table 120, a VC profile cannot be found, and the call SETUP request will be rejected. Thus, for example, if a particular area code is not part of the network, or is not accessible for a particular reason, a called party number will not appear in the table, and a call SETUP request for a call to that area code cannot be accepted.

If a VC profile can be found in the table 120, the narrowband call SETUP request can be accepted, and the VC profile accessed at table 120 is used to access the VC profile database 130. The VC profile database 130 contains parameters including quality-of-service (Qos) and ATM traffic descriptor parameters such as peak cell rate (PCR), sustained cell rate (SCR), and maximum burst rate (MBS) for each virtual channel which is profiled. These parameters are required in order to generate a broadband SETUP message.

With the VC profile parameters provided by the VC profile database 130, and with the called party number obtained from the narrowband SETUP request, a broadband SETUP message is generated by the management processor 50. More particularly, the management processor 50 can either generate the message itself, or it can utilize another processor (not shown) such as processor Part #1000043 sold by Trillium Digital Systems, Inc. to generate the broadband SETUP message in cell format substantially as set forth in prior art Fig. 5c as required by

the UNI 3.1 and/or UNI 4.0 standard. The broadband SETUP message is generated for output on the control plane of the ATM network (i.e., channel 0,5 defined by the ATM forum).

It should be appreciated by those skilled in the art that the databases 110 and 130, and table 120 can be stored in one or more memories, in different types of memory, and can take many different formats. The databases and table are preferably easily programmable in order to meet the needs of users. Thus, for example, if a particular user requires that when a particular number is called, the quality of service and the cell rates must be at certain levels, the table 120 is arranged to designate a certain VC profile for such a called number on the numbering plan of that user.

With the provided apparatus and method of the invention, a true interworking between the narrowband and broadband networks is obtained, as incoming narrowband call requests are processed on a call-by-call basis (utilizing information stored in the table) in order to generate broadband network call SETUP requests on SVCs.

There have been described and illustrated herein a method and apparatus for generating ATM AAL2 type broadband SETUP messages from a narrowband SETUP request. While particular embodiments of the invention have been described, it is not intended that the invention be limited thereto, as it is intended that the invention be as broad in scope as the art will allow and that the specification be read likewise. Thus, while the invention has been described with reference to a particular voice server module of a particular ATM switch, it will be appreciated that the invention applies to different types of apparatus and can be implemented in many different ways. For example, the ATM switch can be a switch of the bus-type rather than a switch of the fabric-type. Moreover, the incoming narrowband call request can be handled in many different ways (e.g., directly by a processor) and need not be subjected to a highway combiner/D-channel extractor. Further, while the

apparatus and method of the invention as described keyed off of the channel ID and the called party number of the incoming narrowband SETUP signal in order to establish interworking, it will be appreciated that other identifiers, such as calling party number, bearer capability, transit network selector, or other information elements, in certain circumstances can be utilized in addition to, or in lieu of called party number and channel ID in establishing the interworking. It will therefore be appreciated by those skilled in the art that yet other modifications could be made to the provided invention without deviating from its spirit and scope as so claimed.

I claim:

1. In an ATM switch having AAL2 capability, an improvement comprising:

means for receiving a narrowband voice call SETUP message;

means for identifying from said narrowband voice call SETUP message at least one characteristic useful in identifying a virtual channel profile;

means linking said at least one characteristic with virtual channel profile parameters; and

means for generating a broadband voice call SETUP message from at least said channel profile parameters.

2. In an ATM switch according to claim 1, wherein:

said at least one characteristic comprises a called party number.

3. In an ATM switch according to claim 1, wherein:

said at least one characteristic comprises a called party number and a channel identification.

4. In an ATM switch according to claim 3, further comprising:

database means linking channel identifications with numbering plans, wherein said means linking said at least one characteristic comprises a table means having a numbering plan field, a called party number field and a VC profile number field.

5. In an ATM switch according to claim 4, wherein:

said means linking said said at least one characteristic further comprises a virtual channel database storing a plurality of parameters for each virtual channel profile.

6. In an ATM switch according to claim 5, wherein:

said plurality of parameters include a quality-of-service parameter, and at least one of a peak cell rate parameter, a sustained cell rate parameter, and a maximum burst size parameter.

7. In an ATM switch according to claim 3, wherein:
said means linking said said at least one characteristic comprises a virtual channel database storing a plurality of broadband parameters for each virtual channel profile.

8. In an ATM switch according to claim 7, wherein:
said plurality of broadband parameters include a quality-of-service parameter, and at least one of a peak cell rate parameter, a sustained cell rate parameter, and a maximum burst size parameter.

9. In an ATM switch according to claim 1, further comprising:
means for placing said broadband voice call SETUP message on a control plane of an ATM network in which said ATM switch is coupled.

10. In an ATM switch, according to claim 1, wherein:
said narrowband voice call SETUP message comprises one of an SS7 ISUP call SETUP message, and an ISDN Q.931 call SETUP message.

11. In an ATM switch having AAL2 capability, an improvement comprising:
means for receiving narrowband voice call SETUP messages;
means for identifying from said narrowband voice call SETUP messages at least one characteristic for each message useful for generating a broadband voice call SETUP message;
means for generating on a call-by-call basis and utilizing said at least one characteristic for each message, a broadband voice call SETUP message.

12. In an ATM switch according to claim 11, wherein:
said at least one characteristic comprises a called party number and a channel identification.

13. In an ATM switch according to claim 11, wherein:

said means for generating comprises a table means for relating said at least one characteristic for each message to a virtual channel profile number, and database means relating each virtual channel profile number to a plurality of broadband parameters.

14. In an ATM switch according to claim 11, wherein:

said means for generating further comprises database means linking channel identifications with numbering plans, wherein said table means includes a numbering plan field, a called party number field and a virtual channel profile number field.

15. A method of interworking a narrowband signaling with broadband signaling, comprising:

obtaining a narrowband voice call SETUP message;

identifying from said narrowband voice call SETUP message at least one characteristic useful in identifying a virtual channel profile;

linking said at least one characteristic with virtual channel profile parameters; and

generating a broadband voice call SETUP message from at least said channel profile parameters.

16. A method according to claim 15, wherein:

said at least one characteristic comprises a called party number and a channel identification.

17. A method according to claim 16, wherein:

said linking comprises using channel identifications to find numbering plans, using said numbering plans and said called party numbers to identify virtual channel profile numbers, and using said virtual channel profile numbers to identify a plurality of said virtual channel profile parameters.

18. A method according to claim 17, wherein:

said plurality of parameters include a quality-of-service parameter, and at least one of a peak cell rate parameter, a sustained cell rate parameter, and a maximum burst size parameter.

19. A method according to claim 15, further comprising:

placing said broadband voice call SETUP message on a control plane of an ATM network.

20. A method according to claim 19, wherein:

said narrowband voice call SETUP message comprises one of an SS7 ISUP call SETUP message, and an ISDN Q.931 call SETUP message, and said broadband voice call SETUP message is an ATM SETUP message.

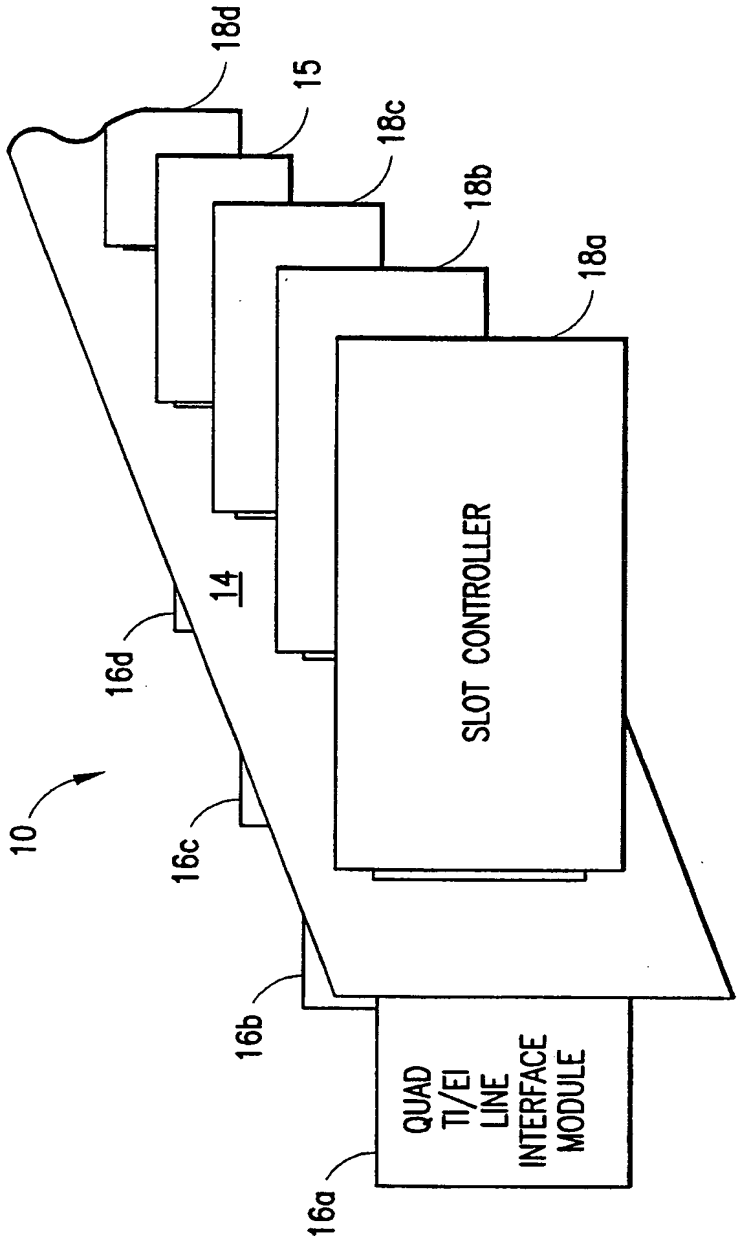

18d
15
18c
18b
18a
SLOT CONTROLLER
14
16d
16c
16b
16a
10
QUAD T1/E1 LINE INTERFACE MODULE

FIG. 1

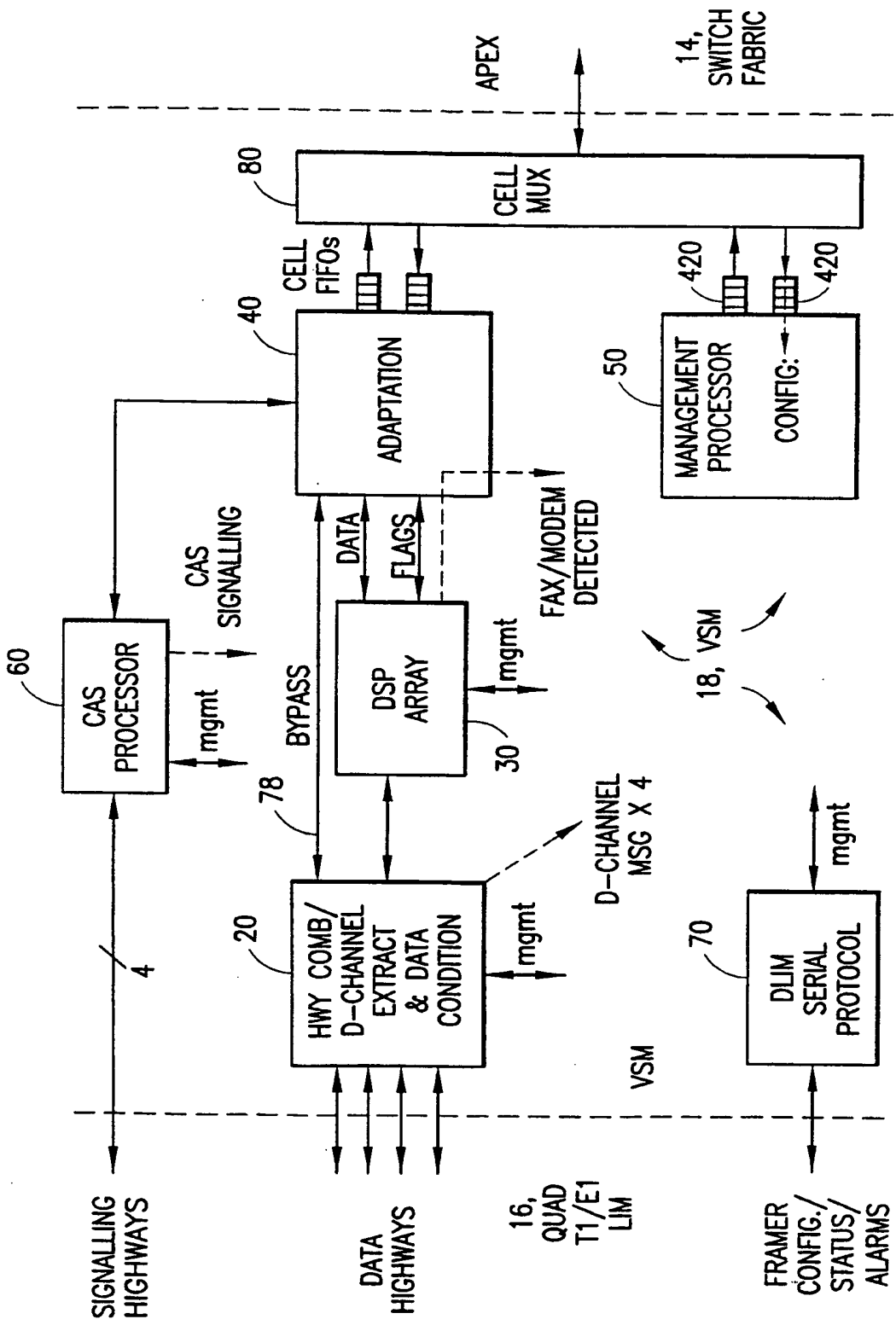

APEX
14, SWITCH FABRIC
80
CELL MUX
CELL FIFOs
40
ADAPTATION
420
420
50
MANAGEMENT PROCESSOR
CONFIG:
CAS SIGNALLING
DATA
FLAGS
FAX/MODEM DETECTED
60
CAS PROCESSOR
mgmt
BYPASS
DSP ARRAY
mgmt
30
18, VSM
78
D-CHANNEL MSG X 4
20
HWY COMB/ D-CHANNEL EXTRACT & DATA CONDITION
mgmt
70
DLIM SERIAL PROTOCOL
mgmt
4
VSM
SIGNALLING HIGHWAYS
DATA HIGHWAYS
16, QUAD T1/E1 LIM
FRAMER CONFIG./ STATUS/ ALARMS
RESOURCE REQUEST PATHS

FIG.2

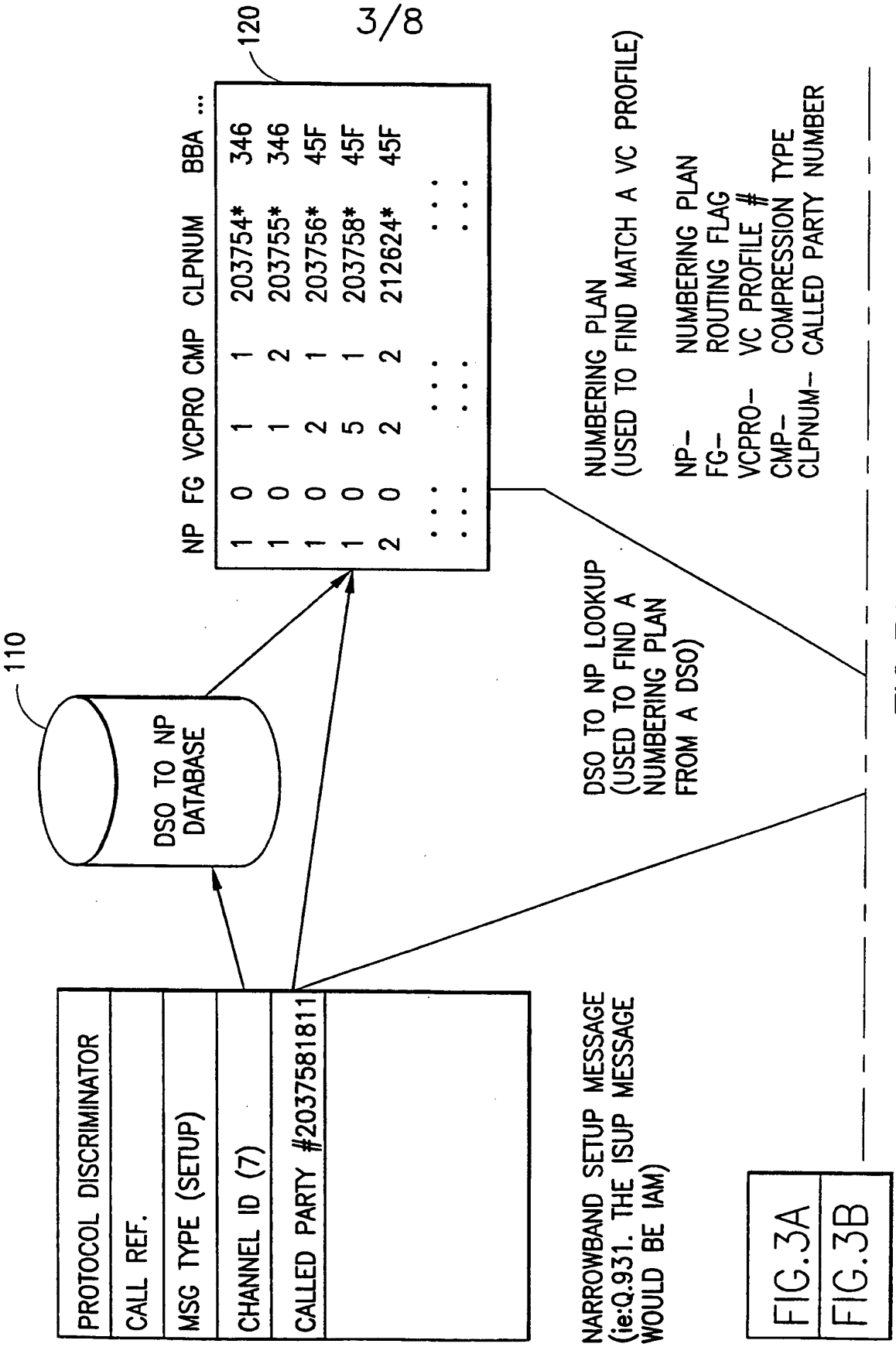

120
NP FG VCPRO CMP CLPNUM BBA ...
1 0 1 1 203754* 346
1 0 1 2 203755* 346
1 0 2 1 203756* 45F
1 0 5 1 203758* 45F
2 0 2 2 212624* 45F
110
DSO TO NP DATABASE
DSO TO NP LOOKUP (USED TO FIND A NUMBERING PLAN FROM A DSO)
NUMBERING PLAN (USED TO FIND MATCH A VC PROFILE)
NP– NUMBERING PLAN
FG– ROUTING FLAG
VCPRO– VC PROFILE #
CMP– COMPRESSION TYPE
CLPNUM– CALLED PARTY NUMBER
PROTOCOL DISCRIMINATOR
CALL REF.
MSG TYPE (SETUP)
CHANNEL ID (7)
CALLED PARTY #2037581811
NARROWBAND SETUP MESSAGE (ie:Q.931. THE ISUP MESSAGE WOULD BE IAM)
FIG.3A
FIG.3B

FIG.3A

FIG.3

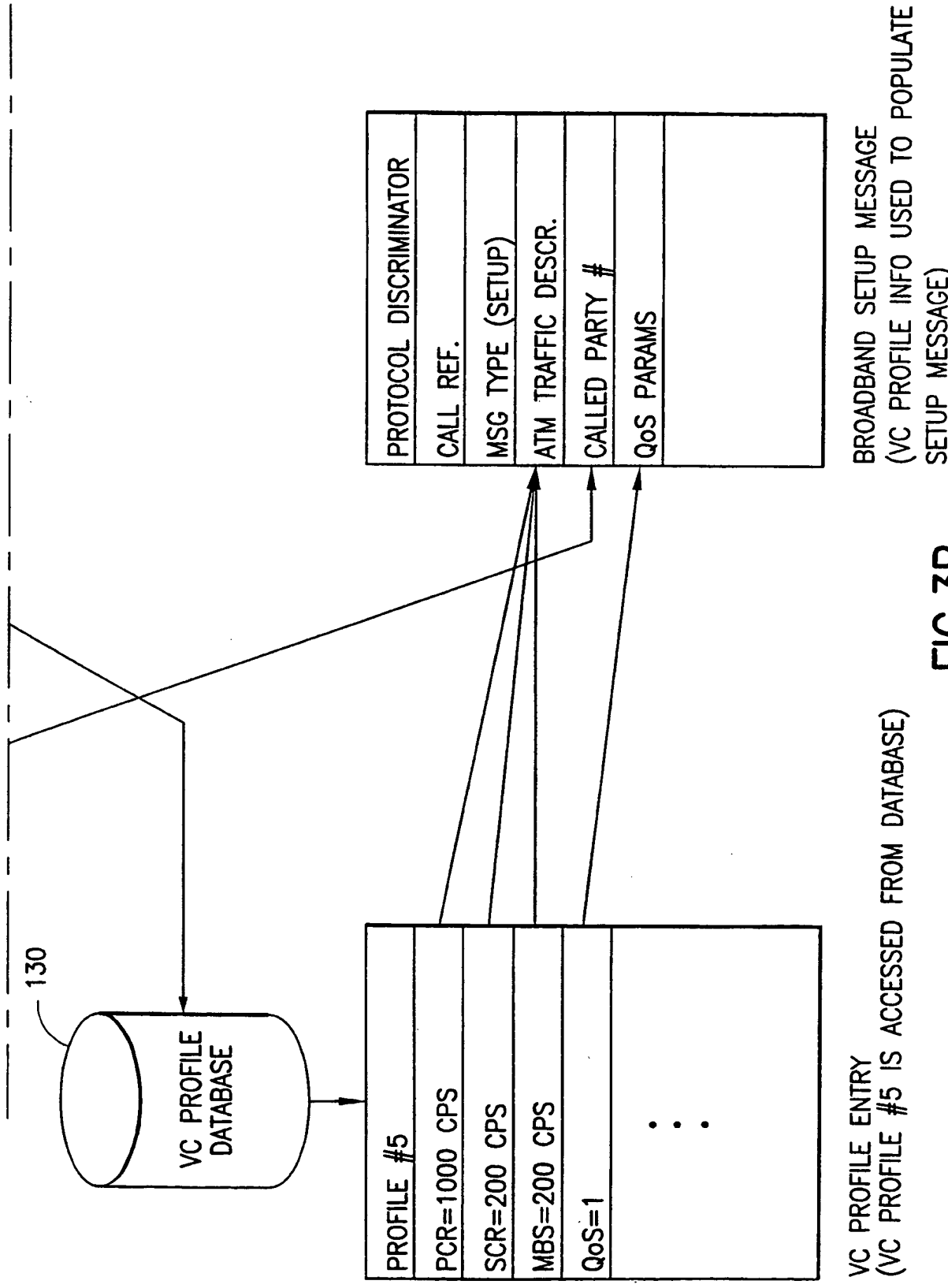

130
VC PROFILE DATABASE
PROFILE #5
PCR=1000 CPS
SCR=200 CPS
MBS=200 CPS
QoS=1
VC PROFILE ENTRY
(VC PROFILE #5 IS ACCESSED FROM DATABASE)
PROTOCOL DISCRIMINATOR
CALL REF.
MSG TYPE (SETUP)
ATM TRAFFIC DESCR.
CALLED PARTY #
QoS PARAMS
BROADBAND SETUP MESSAGE
(VC PROFILE INFO USED TO POPULATE BB SETUP MESSAGE)

FIG.3B

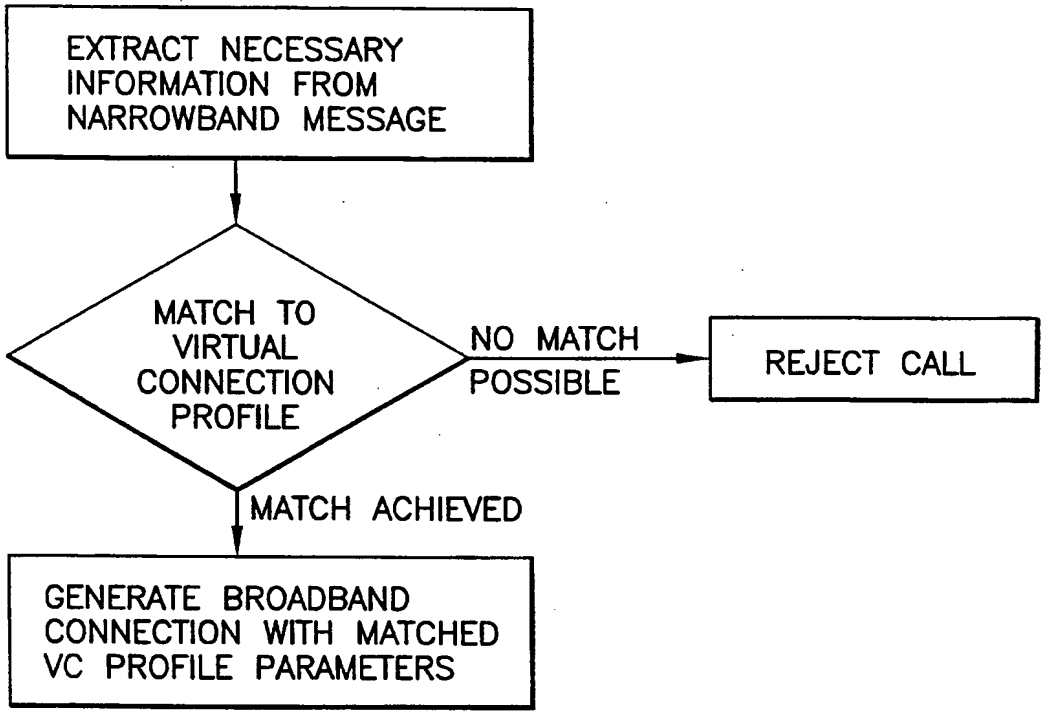

EXTRACT NECESSARY INFORMATION FROM NARROWBAND MESSAGE
MATCH TO VIRTUAL CONNECTION PROFILE
NO MATCH POSSIBLE
REJECT CALL
MATCH ACHIEVED
GENERATE BROADBAND CONNECTION WITH MATCHED VC PROFILE PARAMETERS

FIG.4

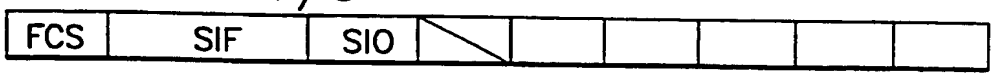
3.1.14 SETUP THIS MESSAGE IS SENT BY THE CALLING USER TO THE NETWORK AND BY THE NETWORK TO THE CALLED USER TO INITIATE CALL ESTABLISHMENT. SEE TABLE 3-15/Q.931.

TABLE 3-15/Q.931
SETUP MESSAGE CONTENT

INFORMATION ELEMENT	REFERENCE	DIRECTION	TYPE	LENGTH
PROTOCOL DISCRIMINATOR	4.2	BOTH	M	1
CALL REFERENCE	4.3	BOTH	M	2-*
MESSAGE TYPE	4.4	BOTH	M	1
SENDING COMPLETE	4.5	BOTH	0 (NOTE 1)	1
REPEAT INDICATOR	4.5	BOTH	0 (NOTE 2)	1
BEARER CAPABILITY	4.5	BOTH	M (NOTE 3)	4-12
CHANNEL INDICATION	4.5	BOTH	0 (NOTE 4)	2-*
PROGRESS INDICATOR	4.5	BOTH	0 (NOTE 5)	2-4
NETWORK SPECIFIC FACILITIES	4.5	BOTH	0 (NOTE 6)	2-*
DISPLAY	4.5	n→u	0 (NOTE 7)	NOTE 8
KEYPAD FACILITY	4.5	u→n	0 (NOTE 9)	2-34
SIGNAL	4.5	n→u	0 (NOTE 10)	2-3
CALLING PARTY NUMBER	4.5	BOTH	0 (NOTE 11)	2-*
CALLING PARTY SUBADDRESS	4.5	BOTH	0 (NOTE 12)	2-23
CALLED PARTY NUMBER	4.5	BOTH	0 (NOTE 13)	2-*
CALLED PARTY SUBADDRESS	4.5	BOTH	0 (NOTE 14)	2-23
TRANSIT NETWORK SELECTION	4.5	u→n	0 (NOTE 15)	2-*
REPEAT INDICATOR	4.5	BOTH	0 (NOTE 16)	1
LOW LAYER COMPATIBILITY	4.5	BOTH	0 (NOTE 17)	2-18
HIGH LAYER COMPATIBILITY	4.5	BOTH	0 (NOTE 18)	2-4

MESSAGE TYPE:SETUP
SIGNIFICANCE:GLOBAL
DIRECTION:BOTH

FIG.5a



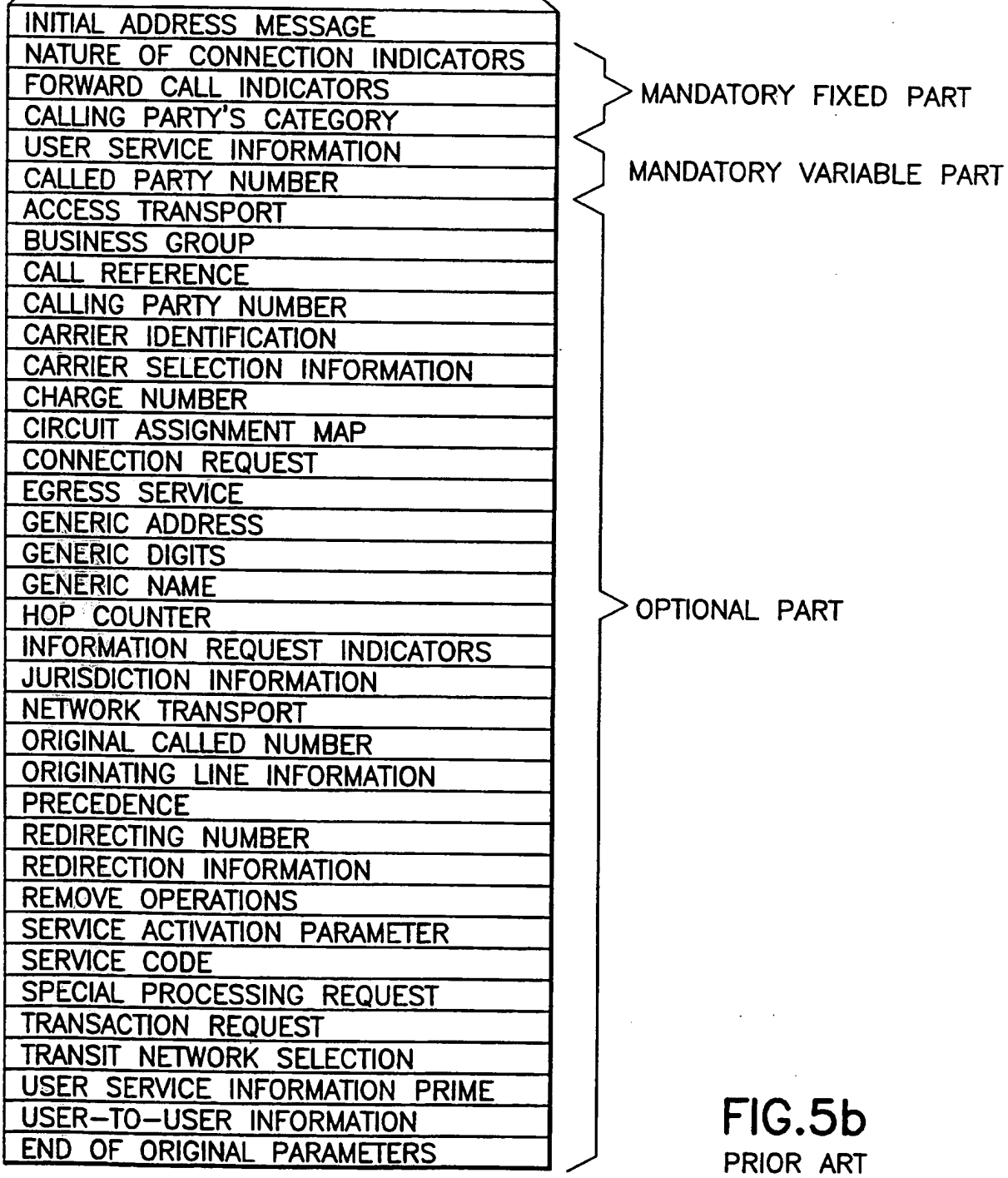


FIG.5b
PRIOR ART

5.3.1.7 SETUP THIS MESSAGE IS SENT BY THE CALLING USER TO THE NETWORK AND BY THE NETWORK TO THE CALLED USER TO INITIATE CALL ESTABLISHMENT.

INFORMATION ELEMENT	REFERENCE	DIRECTION	TYPE	LENGTH
PROTOCOL DISCRIMINATOR	5.4.2	BOTH	M	1
CALL REFERENCE	5.4.3	BOTH	M	4
MESSAGE TYPE	5.4.4.1	BOTH	M	2
MESSAGE LENGTH	5.4.4.2	BOTH	M	2
AAL PARAMETERS	5.4.5.5	BOTH	O (1)	4–21
ATM TRAFFIC DESCRIPTOR	5.4.5.6	BOTH	M	12–30
BROADBAND BEARER CAPABILITY	5.4.5.7	BOTH	M	6–7
BROADBAND HIGH LAYER INFORMATION	5.4.5.8	BOTH	O (2)	4–13
BROADBAND REPEAT INDICATOR	5.4.5.19	BOTH	O (3)	4–5
BROADBAND LOW LAYER INFORMATION	5.4.5.9	BOTH	O (4)	4–17
CALLED PARTY NUMBER	5.4.5.11	BOTH	M	(5)
CALLED PARTY SUBADDRESS	5.4.5.12	BOTH	O (5)	4–25
CALLING PARTY NUMBER	5.4.5.13	BOTH	O (7)	4–26
CALLING PARTY SUBADDRESS	5.4.5.14	BOTH	O (8)	4–25
CONNECTION IDENTIFIER	5.4.5.16	N→U	M	9
QoS PARAMETER	5.4.5.18	BOTH	M	6
BROADBAND SENDING COMPLETE	5.4.5.21	BOTH	O (9)	4–5
TRANSIT NETWORK SELECTION	5.4.5.22	U→N	O(10)	4–8
ENDPOINT REFERENCE	5.4.8.1	BOTH	O(11)	4–7

MESSAGE TYPE:SETUP
SIGNIFICANCE:GLOBAL
DIRECTION:BOTH

FIG.5c

NOTE 1– INCLUDED IN THE USER–TO–NETWORK DIRECTION WHEN THE CALLING USER WANTS TO PASS ATM ADAPTATION LAYER PARAMETERS INFORMATION TO THE CALLED USER. INCLUDED IN THE NETWORK–TO–USER DIRECTION IF CALLING USER INCLUDED AN ATM ADAPTATION LAYER PARAMETERS INFORMATION ELEMENT IN THE SETUP MESSAGE.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US00/08264

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04L 12/56

US CL :370/392, 395, 397, 399, 465, 466, 467, 409, 229, 230, 522

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 370/392, 395, 397, 399, 465, 466, 467, 409, 229, 230, 522

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 6,002,689 A (CHRISTIE et al) 14 December 1999, see col 8, lines 40 to col 9, lines 5, col 10, lines 32-46 and Fig 5.	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)		
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search 01 JUNE 2000	Date of mailing of the international search report 13 JUL 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer STEVEN NGUYEN James R. Matthews Telephone No. (703) 308-8848

Form PCT/ISA/210 (second sheet) (July 1998)*